

HOLLISTER URBAN AREA WATER AND WASTEWATER MASTER PLAN

APPENDIX E - DEMINERALIZATION ALTERNATIVE ANALYSIS

Introduction

The purpose of the demineralization alternative analysis is to determine whether demineralization should be provided for the water supply, recycled water, or both. Selection of the recommended demineralization strategy will be based on the lowest overall life cycle cost. The objectives of this technical memorandum (TM) are as follows:

- ◆ Summarize the basis for alternative development.
- ◆ Describe candidate demineralization alternatives.
- ◆ Present the estimated capital costs, annual operations and maintenance (O&M), distribution, and avoided consumer costs.
- ◆ Summarize the economic analysis results.
- ◆ Recommend a preferred demineralization strategy.

Basis for Alternative Development

The following assumptions were made in developing and comparing the candidate demineralization alternatives:

- ◆ **Drinking Water Quality Objectives**
 - ▲ Total dissolved solids (TDS) concentration of 500 mg/L and a hardness of not greater than 120 mg/L (measured as calcium carbonate). These objectives shall be met as soon as practical and no later than 2015.
 - ▲ Objectives can be achieved by blending treated surface water, groundwater, and/or demineralized groundwater within the distribution system.
- ◆ **Recycled Water Quality Objectives**
 - ▲ Target TDS concentration of 500 mg/L and shall not exceed 700 mg/L. This objective shall be met first by rigorous source control and second by demineralization.
 - ▲ Objectives can be achieved by blending treated effluent and demineralized treated effluent.

◆ **TDS Removal and Disposal Technologies**

- ▲ TDS removal shall be accomplished by reverse osmosis.
- ▲ For this alternative analysis, it is assumed that brine disposal shall be accomplished via brine concentration followed by evaporation ponds.

◆ **Water Demands:** Water demands are equal to the arithmetic average of the demands projected for lower and higher levels of conservation (See Appendix A).

◆ **Surface Water (CVP) Supply:** Surface water supply was assumed to be equal to 3,360 acre-ft per year for current and all future conditions.

◆ **Groundwater Quality:** A summary of the 2005 groundwater quality for the City of Hollister’s eight wells is presented in Table 1. As shown, TDS levels range between a low of 136 mg/L and a high of 1,375 mg/L. The overall flow weighted average TDS concentration is approximately 850 mg TDS/L.

City of Hollister (COH) Well #1 has been off-line for more than one year due to poor water quality (e.g., high nitrate). In addition Cullum Wells #1 and #2 are located outside of the master plan study area. Without these three wells, the overall flow weighted average TDS concentration is approximately 875 mg TDS/L. Considering the location of the Cullum Wells and COH #1 water quality issue, a value of 875 mg TDS/L will be used as the basis for estimating groundwater demineralization capacity requirements in conjunction with the projected water demands, water quality goals, and surface water supply criteria.

Table 1. Summary of 2005 Groundwater Quantity and TDS Data.

Well	Estimated Production (MG)	TDS Concentrations (mg/L)		
		Minimum	Maximum	Average
COH #1	0.86	1,264	1,375	1,302
COH #2	219.55	905	1,020	968
COH #3	77.85	660	840	751
COH #4	371.84	795	940	882
COH #5	296.55	795	905	862
COH #6	49.60	618	740	677
Cullum Well #1 and #2	39.51	136	224	190
Sum ^a	1,055.8	Flow Proportioned Average ^a		849
Sum ^b	1,015.4	Flow Proportioned Average ^b		874

^a Includes all eight wells listed in Table 1.

^b Sum and flow proportioned average without COH #1 and Cullum Wells.

- ◆ **Commercial and Residential TDS Contributions:** The calculated TDS increase from municipal and residential sources is 525 mg/L based on 2004 drinking water and influent wastewater characteristics. This value is considerably higher than the typical range of 150 to 380 mg TDS/L attributed to domestic water use and is likely from home and commercial ion exchange softening units that are estimated to be used by half of the utility's customers.¹ Results described later in this TM are based on the following estimated TDS increases from municipal and residential sources:
 - ▲ A TDS increase of 250 mg/L is assumed for the two alternatives that meet the drinking water TDS and hardness goals described in the MOU (i.e., Alternatives 1 and 2 described later in this TM).
 - ▲ A TDS increase of 525 mg/L is assumed for the alternative that does not meet the drinking water TDS and hardness goals (i.e., Alternative 3 described later in this TM).
- ◆ **Present Worth Analysis**
 - ▲ Costs to be based on 2006 dollars.
 - ▲ Discount rate of 3 percent.
 - ▲ 20 year analysis period.

Candidate Demineralization Alternatives

The following three candidate demineralization alternatives were considered. A copy of the calculations developed for estimating groundwater and recycled water demineralization requirements is provided in Appendix B.

Alternative 1. Groundwater Supply Demineralization

Figure 1 illustrates a proposed groundwater demineralization strategy to achieve both the drinking and recycled water quality goals. The overall quantity of groundwater requiring demineralization is dictated by the recycled water quality goal.

¹ Range obtained from Wastewater Engineering; Treatment and Disposal, Metcalf & Eddy, 2003 and confirmed with data developed for the Stockton Pollution Prevention Plan Implementation (HDR, 2005).

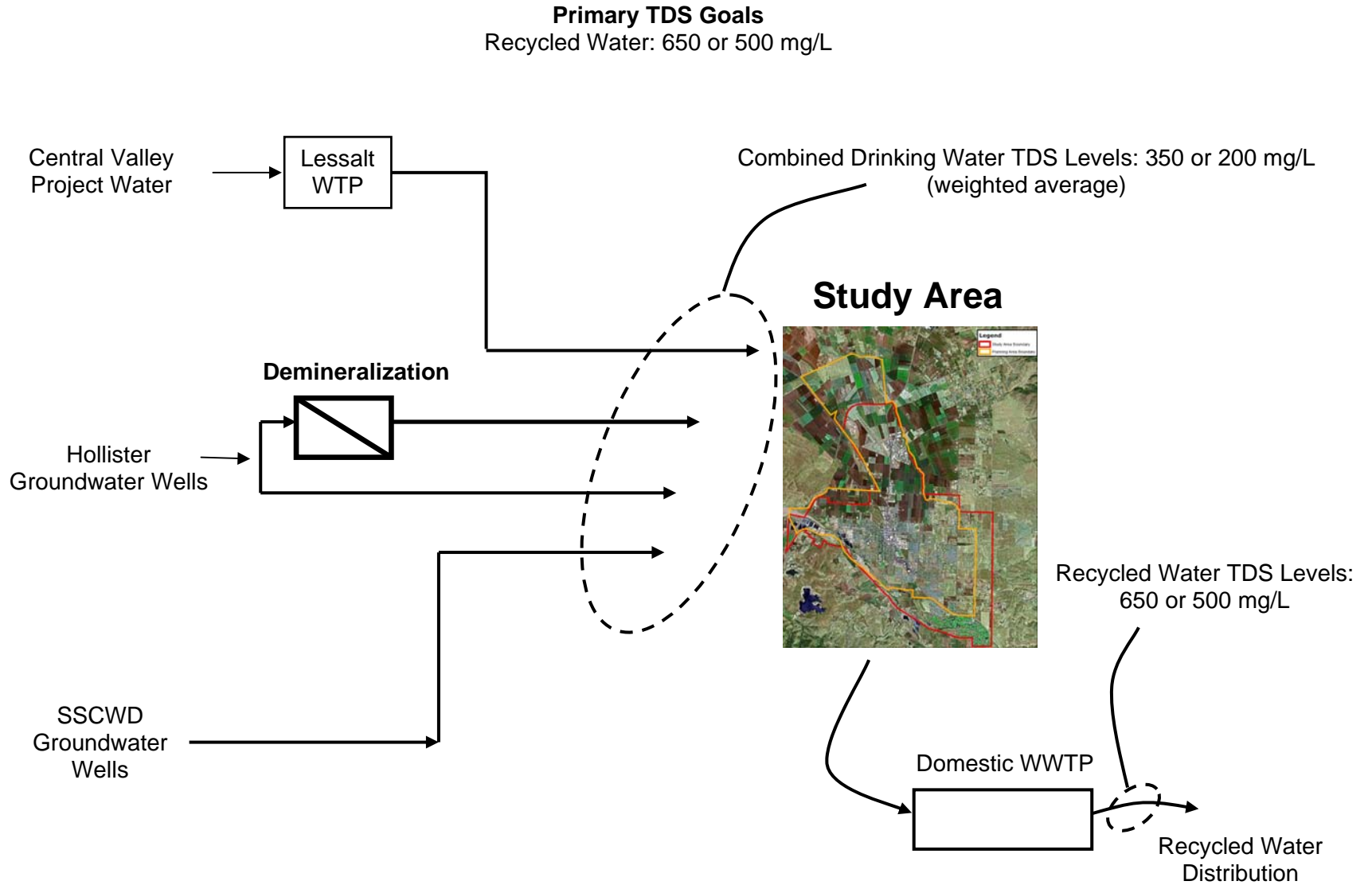


Figure 1. Alternative 1 Groundwater Demineralization

Figure 2 shows the volume of water required from the various supply sources to achieve the criteria described in this TM and a recycled water TDS concentration of 700 mg/L. As shown, the required volume of demineralized groundwater is equal to or slightly more than the volume of Hollister groundwater required throughout the planning period. Initially, a minimum average demineralization capacity of 1.9 million gallons per day (mgd) is required. At buildout (which is beyond 2023), the required average capacity is increased to 7.3 mgd. To achieve a lower TDS goal of 500 mg/L, the required minimum initial and buildout demineralization capacities would increase to 3.6 and 11.3 mgd, respectively.

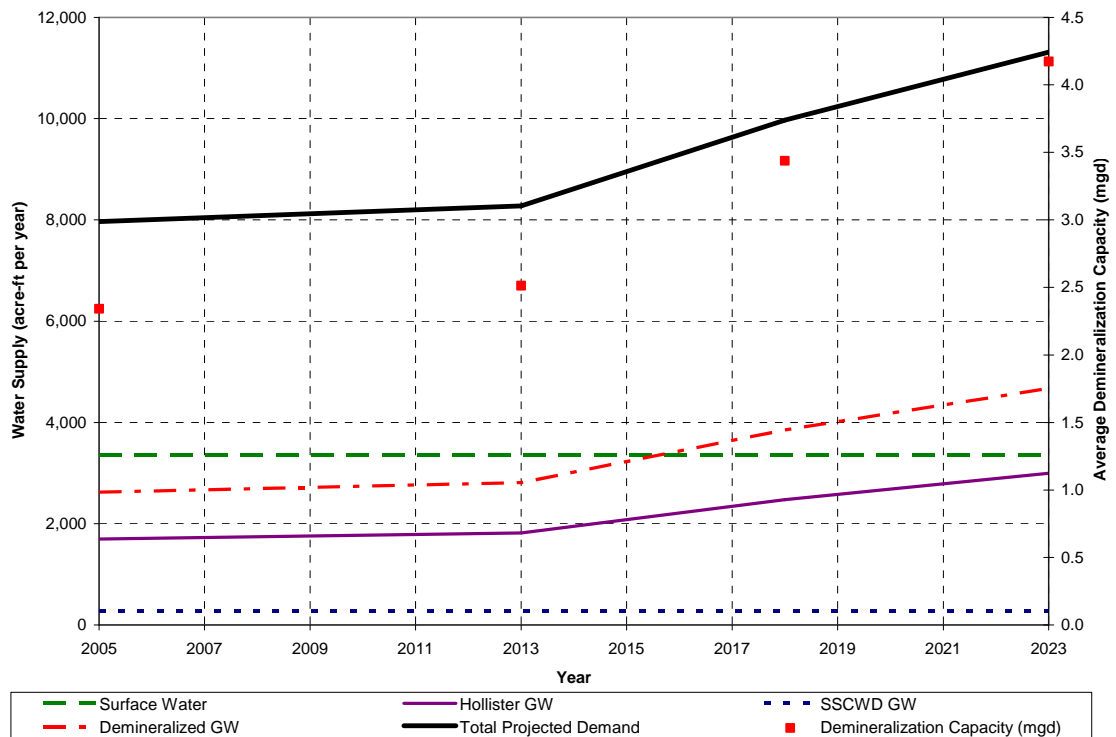


Figure 2. Estimated Water Supply and Demineralization Requirements to Achieve Recycled Water Criterion of 700 mg TDS/L - Alternative 1

Alternative 2. Groundwater Supply and Treated Effluent Demineralization

Figure 3 illustrates a proposed groundwater and treated effluent demineralization strategy to achieve both the drinking and recycled water quality goals. For this alternative, the quantity of groundwater requiring demineralization is dictated by the 500 mg TDS/L drinking water goal. Treated effluent demineralization needs are dictated by reducing the estimated raw wastewater influent TDS concentrations of 750 mg/L to either 700 or 500 mg/L.

Primary TDS Goals
Drinking Water: 500 mg/L
Recycled Water: 650 or 500 mg/L

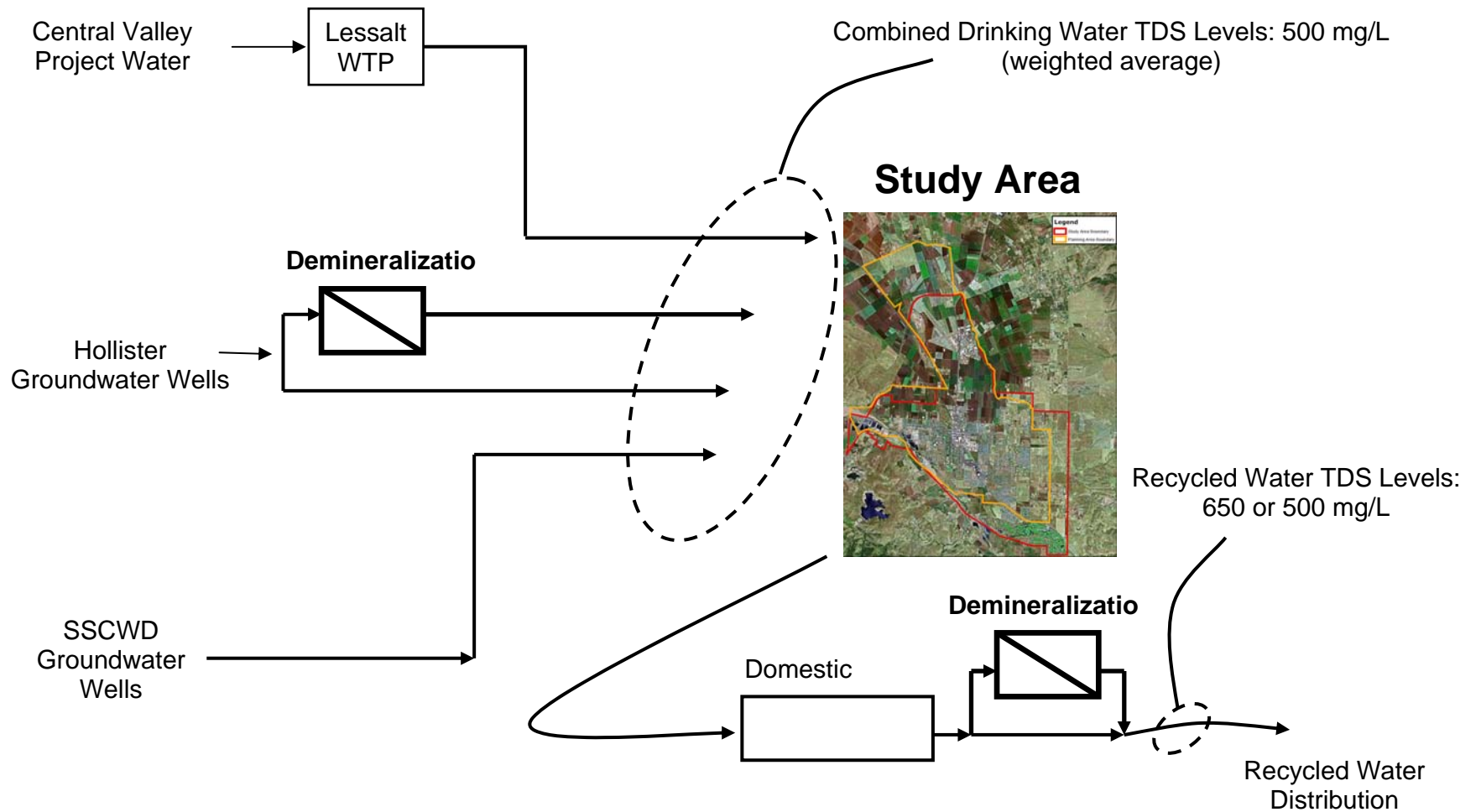


Figure 3. Alternative 2 Groundwater and Treated Effluent Demineralization

Figure 4 shows the volume of water required from the various supply sources to achieve the drinking water goal of 500 mg TDS/L and a recycled water goal of 650 mg TDS/L. Initially, minimum average groundwater and treated effluent demineralization capacities of 1.1 and 0.2 mgd, respectively, are required. At buildout, these required capacities are increased to 5.4 and 0.5 mgd, respectively. If the recycled water goal is decreased to 500 mg TDS/L, average treated effluent demineralization capacities of 0.9 and 2.6 mgd, respectively, are required initially and at buildout.

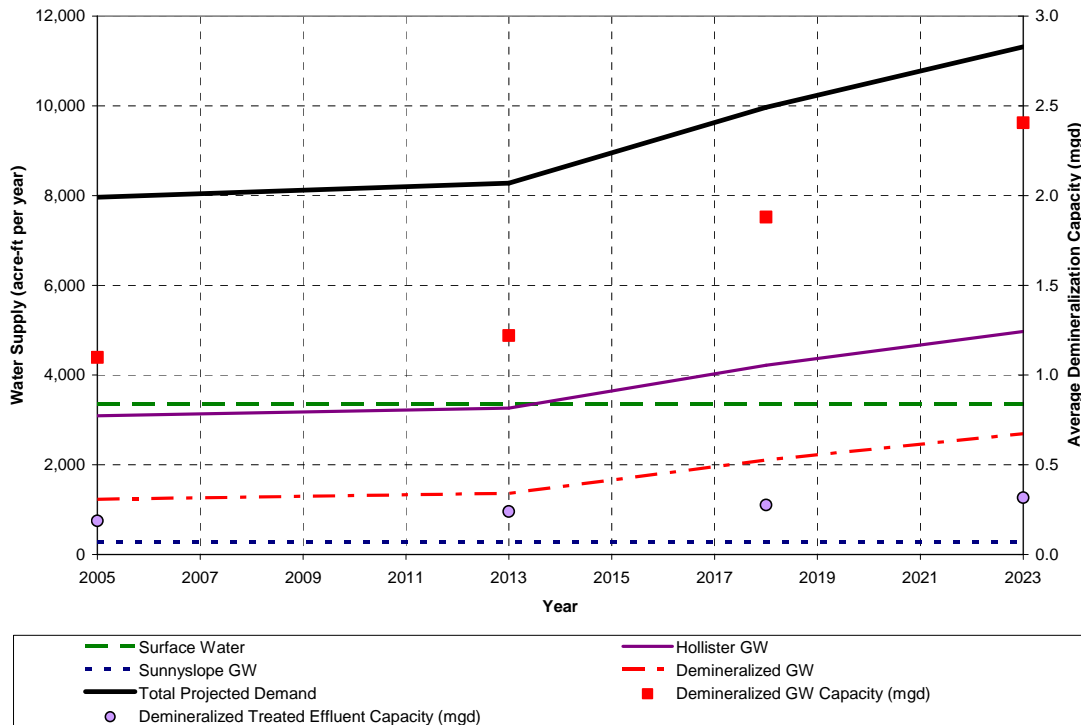


Figure 4. Estimated Water Supply and Demineralization Capacity Requirements to Achieve Recycled Water Criterion of 700 mg TDS/L - Alternative 2

Alternative 3. Treated Effluent Demineralization

Figure 5 illustrates a proposed treated effluent demineralization strategy to achieve the recycled water quality goals. This alternative reflects a “do nothing alternative” with regard to the drinking water TDS goals described in the MOU since no drinking water TDS removal is provided.

For this alternative, a minimum average treated effluent demineralization capacity of 1.1 mgd is required initially to achieve a treated effluent TDS goal of 700 mg/L. At buildout, the required capacity is increased to 3.6 mgd. If the recycled water goal is lowered to 500 mg TDS/L, the initial and buildout capacity requirements are 1.6 and 4.8 mgd, respectively.

Primary TDS Goals
 Drinking Water: None
 Recycled Water: 650 or 500 mg/L

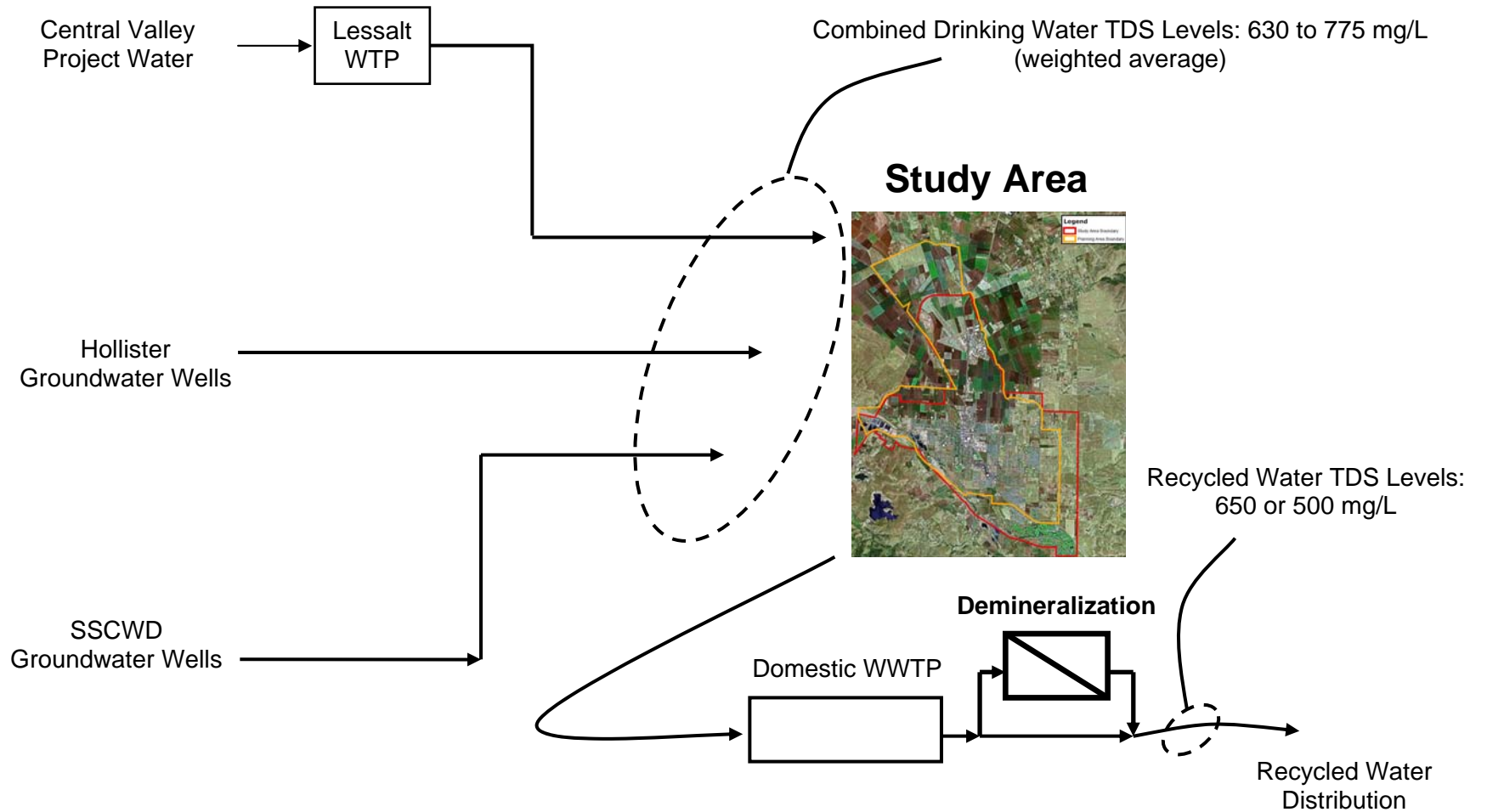


Figure 5. Treated Effluent Demineralization

Demineralization Cost Curves

Figure 6 and Figure 7 present the total estimated capital and O&M cost in terms of dollars per gallon of permeate for demineralization. The capital cost curves include pretreatment, feed water pumping, membrane process system, chemical cleaning system, housing, and a 25 percent allowance for engineering and administration. The curves are applicable to both groundwater and treated effluent demineralization. As shown, there are no capital cost differences between potential feed water TDS concentrations since all four curves are equal with regard to capacity and cost.

The following factors were used for estimating the capital and O&M costs described later in this TM.

◆ Capital Costs

- ▲ Drinking Water: Demineralization costs are based on a maximum day to average demand peaking factor of 2.0.
- ▲ Recycled Water: Demineralization costs are based on annual average flows.

◆ O&M Costs: Drinking and recycled water costs are based on average annual demands and flows.

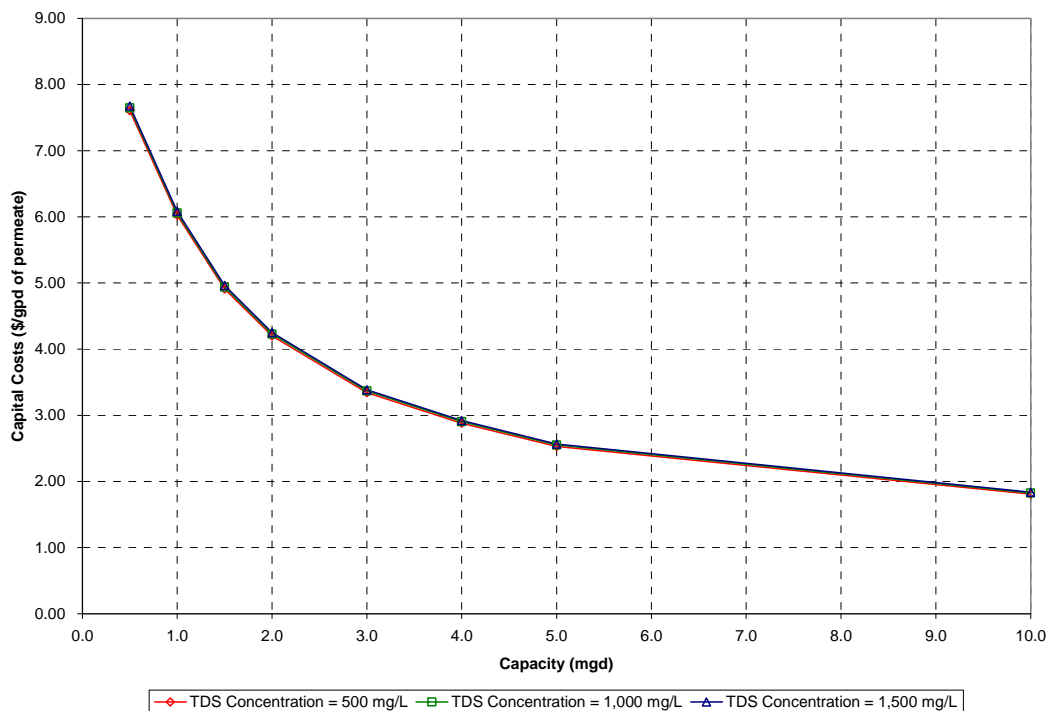


Figure 6. Estimated Demineralization Capital Costs for Various Plant Capacities

Brine Disposal Cost Curves

Capital and O&M cost curves for brine disposal are presented in Figure 8 and Figure 9. Costs presented in this figure are based on a land cost of \$30,000 per acre and double pass RO configuration (to reduce brine volume) with an overall efficiency of 93 percent. This configuration is recommended to minimize overall land requirements.

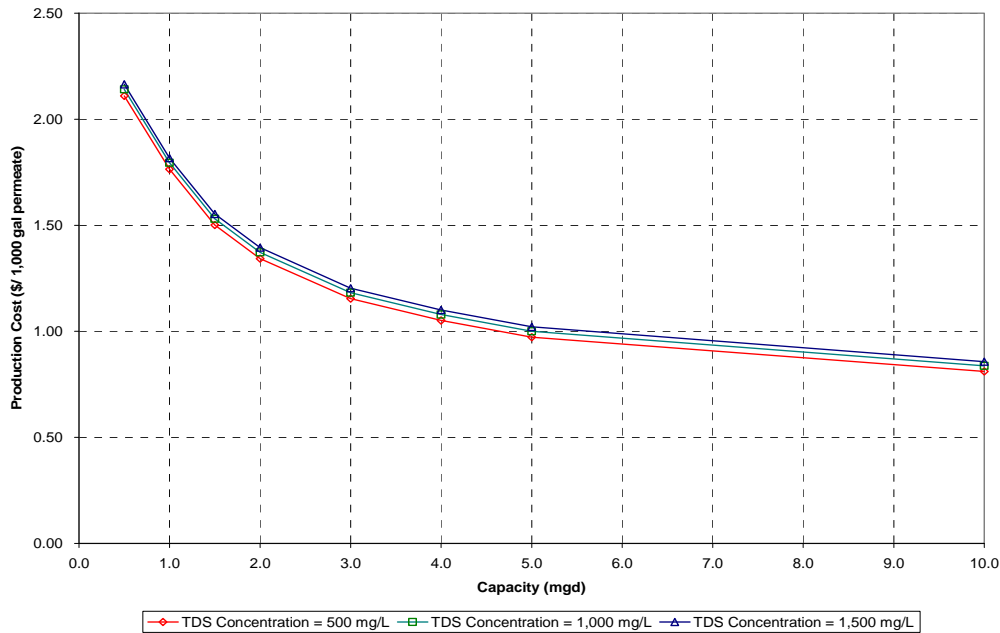


Figure 7. Estimated Demineralization Operating Costs for Various Plant Capacities

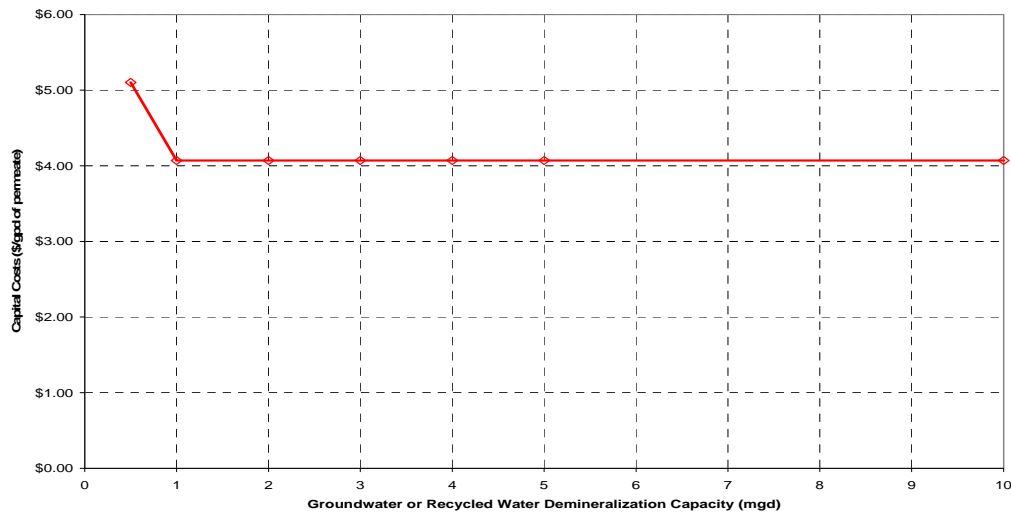


Figure 8. Estimated Brine Disposal Capital Costs for Various Plant Capacities

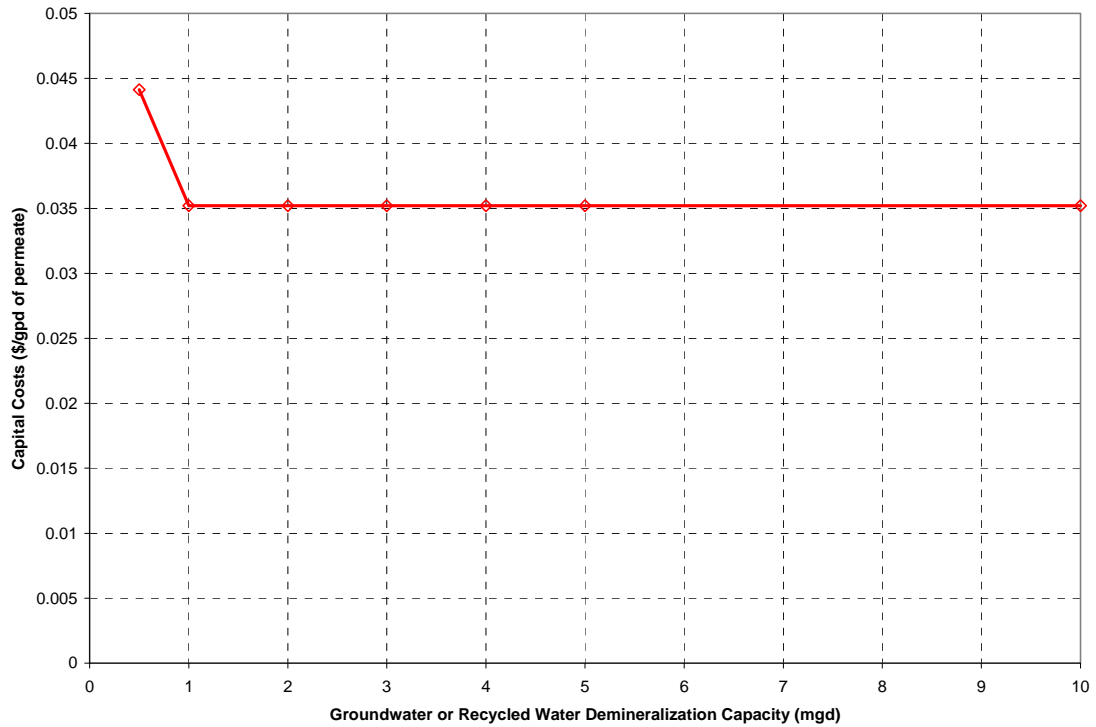


Figure 9. Estimated Operating Costs for Various Plant Capacities

Avoided Consumer Costs

Table 2 presents a summary of the avoided costs associated with the three demineralization alternatives. Values shown in this table are based on the avoided consumer costs with reduced drinking water TDS concentrations as compared to the current average TDS concentration of 875 mg/L. Avoided costs include reduced bottled/filtered water use; increased faucet, garbage disposal, clothes and dish washer, water heater, and residential water distribution pipeline service life expectancies; reduced operating expenses for residential water softening systems; and reduced purchases of residential water softening systems.

Table 2. Avoided Consumer Costs

Alternative	Consumer Cost Savings	Consumer Cost Savings
	(\$/resident-yr)	(\$/mgTDS/L removed – resident)
Alt 1. Groundwater Demineralization	195 and 250 ^a	0.37 and 0.41 ^a
Alt 2. Groundwater and Recycled Water Demineralization	184.9	0.49
Alt 3. Recycled Water Demineralization	0	0

^aBased on drinking water quality of 700 and 500 mg TDS/L respectively.

Costs presented in this table are based on a review of the following four documents:

- ◆ City of Davis, Joint Water Supply Feasibility Study for the City of Davis and University of California, Davis, May 2002 (Draft).
- ◆ Central Arizona Salinity Study, Phase I Report, December 2003.
- ◆ Metropolitan Water District of Southern California and United States Bureau of Reclamation, Salinity Management Study, June 1999 (Final Report)
- ◆ Preliminary consumer cost saving curves presented at CALFED Economics Workgroup.

Net Present Worth Cost Comparison

Table 3 presents a summary of the net present worth cost comparison results. When comparing alternatives, it is important to keep in mind that Alternative 3 is essentially a “do nothing” alternative with respect to drinking water TDS since it does not meet the MOU goals or attempt to reduce drinking water TDS concentrations. Cost comparison results show that a groundwater and recycled water demineralization strategy (Alternative 2) is the most cost effective approach if a recycled water TDS concentration of 700 mg/L is targeted. If a lower TDS concentration is desired, groundwater demineralization (Alternative 1) and Alternative 2 are essentially equal with regard to net present worth costs.

Comparison results also indicate that targeting a recycled water TDS goal of 500 mg/L is expected to cost 60 to 80 percent more than targeting the higher TDS level of 700 mg/L.

Table 3. Summary of Net Present Worth Cost Comparison

Alternative	Alternative 1 - Groundwater Demineralization		Alternative 2 – Groundwater and Recycled Water Demineralization		Alternative 3 – Recycled Water Demineralization ^c	
	700 mg/L	500 mg/L	700 mg/L	500 mg/L	700 mg/L	500 mg/L
Recycled Water TDS Goal	700 mg/L	500 mg/L	700 mg/L	500 mg/L	700 mg/L	500 mg/L
Capital Costs (\$)^a						
Groundwater Demineralization	21,995,000	28,455,000	18,670,000	18,670,000	0	0
Recycled Water Demineralization	0	0	2,300,000	9,560,000	11,400,000	13,665,000
Brine Disposal	14,660,000	24,020,000	10,990,000	16,280,000	8,140,000	11,400,000
Subtotal (\$)	36,660,000	52,470,000	31,960,000	44,510,000	19,540,000	25,065,000
Operations and Maintenance Costs (\$/yr)^b						
Groundwater Demineralization	3,540,000	5,090,000	2,665,000	2,665,000	0	0
Recycled Water Demineralization	0	0	555,000	2,245,000	2,525,000	3,155,000
Brine Disposal	105,000	180,000	85,000	125,000	40,000	75,000
Avoided Consumer Costs	-2,515,000	-3,015,000	-2,230,000	-2,230,000	0	0
Subtotal (\$/yr)	1,130,000	2,255,000	1,075,000	2,805,000	2,565,000	3,230,000
Subtotal (\$)^d	16,830,000	33,555,000	15,995,000	41,740,000	38,180,000	48,040,000
TOTAL NET PRESENT WORTH COST	53,140,000	86,025,000	47,955,000	86,250,000	57,720,000	73,105,000

^a Includes both Phase I (immediate) and Phase II (completed by 2013) improvements. Rounded to the nearest \$5,000.

^b Overall weighted average O&M cost. Rounded to the nearest \$5,000.

^c Alternative does not meet the drinking water goals and objectives described in the MOU.

^d Net present worth of annual O&M costs.

Conclusions and Recommendations

The following is a summary of the conclusions and recommendations developed from the alternative analysis:

- ◆ **TDS Mass Balance Development.** The calculated TDS increase from municipal and residential sources is 525 mg/L which is higher than the typical range and is attributed to the use of softening units. Results described in this TM are based on an assumed TDS increase of either 250 or 525 mg TDS/L depending on drinking water quality.
- ◆ **Recommended alternative.** Alternative 1 (Groundwater Demineralization) is the recommended alternative since it (along with Alternative 2) is the most cost effective strategy for achieving a recycled water goal of 500 mg TDS/L while meeting the drinking water goals, limits demineralization operations to one stream, and provides the greatest consumer benefits. This demineralization strategy should be used as the basis for the development of the comprehensive alternatives carried forward into the Alternatives Screening Process.
- ◆ **Alternative TDS Removal Technology.** HDR is currently investigating the feasibility of using softening instead of reverse osmosis for TDS and hardness removal.

Attachment A

Attachment A
Hollister Urban Area Water and Wastewater Master Plan
Conservation Analysis
14-Jun-06

Total Demands - Lower Level of Conservation					
	2005	2013	2018	2023	BO
Demands before Conservation	7965	9286	11356	12775	21914
Existing Res	5576	5144	5144	5144	5144
Existing Non-Res	2390	2065	2065	2065	2065
Existing Total		7209	7209	7209	7209
Projected Res		748	1476	2081	8821
Projected Non-Res		425	1610	2550	4119
Projected Total		1173	3086	4631	12939
Total Demands		8381	10294	11840	20148
Conservation Savings		10%	9%	7%	8%

Conservation estimates based on 2000 UWMP:
4% reduction for UFW savings for existing and projected demands (UWMP).
10% reduction of existing and projected nonresidential demands (UWMP).
6% reduction for projected residential demands (derived from UWMP).
417af reduction for existing residential at 2013 and 2018 (85% of UWMP estimate of 490af at 2010).

Total Demands - Higher Level of Conservation					
	2005	2013	2018	2023	BO
Demands before Conservation	7965	9286	11356	12775	21914
Existing Res	5576	5085	4831	4589	4589
Existing Non-Res	2390	2065	2065	2065	2065
Existing Total		7149	6895	6654	6654
Projected Res		597	1139	1588	6936
Projected Non-Res		425	1610	2550	4119
Projected Total		1022	2750	4138	11055
Total Demands		8171	9645	10791	17709
Conservation Savings		12%	15%	16%	19%

Conservation estimates based on GMP, 2000 UWMP, and more aggressive residential assumptions:
4% reduction for UFW savings for existing and projected demands (UWMP).
10% reduction of existing and projected nonresidential demands (UWMP).
25% reduction of projected residential demands (more aggressive savings assumption).
Assuming residential remains at 70% of total demands, the 2005 demands were reduced by 1%/yr until 2023 (GMP).

Attachment B

Table B1a. Alternative 1 Raw Water Supply and Demineralization Capacity Requirements

Target Water Quality Goals (mg TDS/L)	Calculation Basis	MOU	TDS Gain Calibration					Buildout	Source
			2004 Data	Modified	MOU Goals	2005	2013		
Drinking Water	400	500							
Recycled Water	700	500 to 700							
Projected Water Demands									
Lower Level of Conservation				7,965	8,381	10,294	11,840	20,148	June 14, 2006 Water Demand Projections
Higher Level of Conservation				7,965	8,171	9,645	10,791	17,709	June 14, 2006 Water Demand Projections
Average				7,965	8,276	9,970	11,315	18,928	Arithmetic average of lower and higher levels of conservation
Water Supply TDS Concentrations									
Surface Water - Lessalt	300	300		300	300	300	300	300	Average 2004 Annual Drinking Water Quality Report, City of Hollister
Groundwater - COH	820	850		875	875	875	875	875	Average 2004 Annual Drinking Water Quality Report, City of Hollister
Groundwater - SSCWD	775	850		875	875	875	875	875	Average 2004 Annual Drinking Water Quality Report, City of Hollister
Demineralized Groundwater	0	0		17.5	17.5	17.5	17.5	17.5	98 percent removal of SSCWD groundwater TDS
Water Supply									
Surface Water - Lessalt	1,019	1,019		3,360	3360	3360	3360	3360	2004 Annual Drinking Water Quality Report, City of Hollister
Groundwater - COH	2,871	2,871		2,161	2,300	3,055	3,655	7,051	2004 Annual Drinking Water Quality Report, City of Hollister
Groundwater - SSCWD	285	285		285	285	285	285	285	2004 Annual Drinking Water Quality Report, City of Hollister
Demineralized Groundwater				2,159	2,331	3,269	4,015	8,232	
Water Supply - Calculated Ave TDS Concentration	690	716		400	400	400	400	400	
Target TDS Concentration - Water Supply			500	500	500	500	500	500	Weighted average TDS concentration
Raw Wastewater TDS Concentration	1,214	1,214							Historic 2004 WWTP Data
Gain from Water Supply to Raw Wastewater	524	498		250	250	250	250	250	
Target TDS Concentration - Treated Effluent			500 to 700	700	700	700	700	700	
Required Water Supply TDS (governs)				400	400	400	400	400	Target Drinking Water TDS Concentration to achieve recycled water goals
Demineralization Capacity - Average (mgd)				1.9	2.1	2.9	3.6	7.3	Estimated demineralization capacity requirements

Table B1b. Alternative 1 Raw Water Supply and Demineralization Capacity Requirements

Target Water Quality Goals (mg TDS/L)	Calculation Basis		MOU									
	200	500	500									
Drinking Water			500									
Recycled Water			500 to 700									
				TDS Gain Calibration		Year						
				2004 Data	Modified	MOU Goals	2005	2013	2018	2023	Buildout	Source
Projected Water Demands												
Lower Level of Conservation				7,965			8,381	10,294	11,840	20,148		June 14, 2006 Water Demand Projections
Higher Level of Conservation				7,965			8,171	9,645	10,791	17,709		June 14, 2006 Water Demand Projections
	Average			7,965			8,276	9,970	11,315	18,928		Arithmetic average of lower and higher levels of conservation
Water Supply TDS Concentrations												
Surface Water - Lessalt		300	300	300			300	300	300	300	300	Average 2004 Annual Drinking Water Quality Report, City of Hollister
Groundwater - COH		820	850	875			875	875	875	875	875	Average 2004 Annual Drinking Water Quality Report, City of Hollister
Groundwater - SSCWD		775	850	875			875	875	875	875	875	Average 2004 Annual Drinking Water Quality Report, City of Hollister
Demineralized Groundwater		0	0	17.5			17.5	17.5	17.5	17.5	17.5	98 percent removal of SSCWD groundwater TDS
Water Supply												
Surface Water - Lessalt		1,019	1,019	3,360			3,360	3,360	3,360	3,360	3,360	2004 Annual Drinking Water Quality Report, City of Hollister
Groundwater - COH		2,871	2,871	303			369	730	1,016	2,637	2,637	2004 Annual Drinking Water Quality Report, City of Hollister
Groundwater - SSCWD		285	285	285			285	285	285	285	285	2004 Annual Drinking Water Quality Report, City of Hollister
Demineralized Groundwater				4,017			4,262	5,595	6,654	12,647		
Water Supply - Calculated Ave TDS Concentration		690	716	200			200	200	200	200	200	
Target TDS Concentration - Water Supply							500	500	500	500	500	Weighted average TDS concentration
Raw Wastewater TDS Concentration		1,214	1,214									Historic 2004 WWTP Data
Gain from Water Supply to Raw Wastewater		524	498				250	250	250	250	250	
Target TDS Concentration - Treated Effluent							500	650	650	650	650	
Required Water Supply TDS (governs)							200	200	200	200	200	Target Drinking Water TDS Concentration to achieve recycled water
Demineralization Capacity - Average (mgd)				3.6			3.8	5.0	5.9	11.3		Estimated demineralization capacity requirements

Table B2a. Alternative 2 Raw Water Supply and Demineralization Capacity Requirements

Target Water Quality Goals (mg TDS/L)	Calculation Basis		MOU	Year					Buildout	Source
	Drinking Water	Recycled Water	500 700	500 500 to 700	2005	2013	2018	2023		
		TDS Gain Calibration		MOU Goals						
		2004 Data	Modified		2005	2013	2018	2023	Buildout	Source
Projected Water Demands										
Lower Level of Conservation				7,965	8,381	10,294	11,840	20,148	June 14, 2006 Water Demand Projections	
Higher Level of Conservation				7,965	8,171	9,645	10,791	17,709	June 14, 2006 Water Demand Projections	
	Average			7,965	8,276	9,970	11,315	18,928	Arithmetic average of lower and higher levels of conservation	
Water Supply TDS Concentrations										
Surface Water - Lessalt	300	300		300	300	300	300	300	Average 2004 Annual Drinking Water Quality Report, City of Hollister	
Groundwater - COH	627	1175		875	875	875	875	875	Average 2004 Annual Drinking Water Quality Report, City of Hollister	
Groundwater - SSCWD	775	1175		875	875	875	875	875	Average 2004 Annual Drinking Water Quality Report, City of Hollister	
Demineralized Groundwater	0	0		17.5	17.5	17.5	17.5	17.5	98 percent removal of SSCWD groundwater TDS	
Water Supply										
Surface Water - Lessalt	1,019	1,019		3,360	3360	3360	3360	3360	2004 Annual Drinking Water Quality Report, City of Hollister	
Groundwater - COH	2,871	2,871		3,090	3,265	4,218	4,975	9,259	2004 Annual Drinking Water Quality Report, City of Hollister	
Groundwater - SSCWD	285	285		285	285	285	285	285	2004 Annual Drinking Water Quality Report, City of Hollister	
Demineralized Groundwater				1,230	1,366	2,107	2,695	6,025		
Water Supply - Calculated Ave TDS Concentration	557	961		500	500	500	500	500		
Target TDS Concentration - Water Supply			500	500	500	500	500	500	Weighted average TDS concentration	
Wastewater Effluent TDS Concentration	1,214	1,214		1,264	1,264	1,264	1,264	1,264	Historic 2004 WWTP Data	
Gain from Water Supply to Treated Effluent	657	253		250	250	250	250	250		
Raw Wastewater TDS Concentration				750	750	750	750	750		
Target TDS Concentration - Treated Effluent			500 to 700	700	700	700	700	700		
Average Annual WWTP Flow (mgd)				2.72	3.48	4.00	4.59	7.68		
Demineralized Treated Effluent Quality				25.28	25.28	25.28	25.28	25.28		
Treated Effluent Flow (no demin)				2.5	3.2	3.7	4.3	7.1		
Calculated Effluent TDS Concentration				700	700	700	700	700		
Demineralization Capacity Requirements - Average (mgd)										
Water Supply				1.1	1.2	1.9	2.4	5.4	Estimated demineralization capacity requirements	
Recycled Water				0.2	0.2	0.3	0.3	0.5		

Table B2b. Alternative 2 Raw Water Supply and Demineralization Capacity Requirements

Target Water Quality Goals (mg TDS/L)	Calculation Basis		MOU	Year					Buildout	Source
	Drinking Water	Recycled Water	500	500	2005	2013	2018	2023		
	TDS Gain Calibration		MOU Goals	2005	2013	2018	2023	Buildout	Source	
	2004 Data	Modified								
Projected Water Demands										
Lower Level of Conservation				7,965	8,381	10,294	11,840	20,148	June 14, 2006 Water Demand Projections	
Higher Level of Conservation				7,965	8,171	9,645	10,791	17,709	June 14, 2006 Water Demand Projections	
Average				7,965	8,276	9,970	11,315	18,928	Arithmetic average of lower and higher levels of conservation	
Water Supply TDS Concentrations										
Surface Water - Lessalt	300	300		300	300	300	300	300	Average 2004 Annual Drinking Water Quality Report, City of Hollister	
Groundwater - COH	627	1175		875	875	875	875	875	Average 2004 Annual Drinking Water Quality Report, City of Hollister	
Groundwater - SSCWD	775	1175		875	875	875	875	875	Average 2004 Annual Drinking Water Quality Report, City of Hollister	
Demineralized Groundwater	0	0		17.5	17.5	17.5	17.5	17.5	98 percent removal of SSCWD groundwater TDS	
Water Supply										
Surface Water - Lessalt	1,019	1,019		3,360	3360	3360	3360	3360	2004 Annual Drinking Water Quality Report, City of Hollister	
Groundwater - COH	2,871	2,871		3,090	3,265	4,218	4,975	9,259	2004 Annual Drinking Water Quality Report, City of Hollister	
Groundwater - SSCWD	285	285		285	285	285	285	285	2004 Annual Drinking Water Quality Report, City of Hollister	
Demineralized Groundwater				1,230	1,366	2,107	2,695	6,025		
Water Supply - Calculated Ave TDS Concentration	557	961		500	500	500	500	500		
Target TDS Concentration - Water Supply			500	500	500	500	500	500	Weighted average TDS concentration	
Wastewater Effluent TDS Concentration	1,214	1,214		1,264	1,264	1,264	1,264	1,264	Historic 2004 WWTP Data	
Gain from Water Supply to Treated Effluent	657	253		250	250	250	250	250		
Raw Wastewater TDS Concentration				750	750	750	750	750		
Target TDS Concentration - Treated Effluent			500 to 700	500	500	500	500	500		
Average Annual WWTP Flow (mgd)				2.72	3.48	4.00	4.59	7.68		
Demineralized Treated Effluent Quality				25.28	25.28	25.28	25.28	25.28		
Treated Effluent Flow (no demin)				1.8	2.3	2.6	3.0	5.0		
Calculated Effluent TDS Concentration				500	500	500	500	500		
Demineralization Capacity Requirements - Average (mgd)										
Water Supply				1.1	1.2	1.9	2.4	5.4	Estimated demineralization capacity requirements	
Recycled Water				0.9	1.2	1.4	1.6	2.6		

Table B3a. Alternative 3 Raw Water Supply and Demineralization Capacity Requirements

Target Water Quality Goals (mg TDS/L)	Calculation Basis	MOU									
Drinking Water	None	500									
Recycled Water	650	500 to 700									
			TDS Gain Calibration		Year						
			2004 Data	Modified	MOU Goals	2005	2013	2018	2023	Buildout	Source
Projected Water Demands											
Lower Level of Conservation						7,965	8,381	10,294	11,840	20,148	June 14, 2006 Water Demand Projections
Higher Level of Conservation						7,965	8,171	9,645	10,791	17,709	June 14, 2006 Water Demand Projections
	Average					7,965	8,276	9,970	11,315	18,928	Arithmetic average of lower and higher levels of conservation
Water Supply TDS Concentrations											
Surface Water - Lessalt	300	300				300	300	300	300	300	Average 2004 Annual Drinking Water Quality Report, City of Hollister
Groundwater - COH	627	1175				875	875	875	875	875	Average 2004 Annual Drinking Water Quality Report, City of Hollister
Groundwater - SSCWD	775	1175				875	875	875	875	875	Average 2004 Annual Drinking Water Quality Report, City of Hollister
Demineralized Groundwater	0	0				17.5	17.5	17.5	17.5	17.5	98 percent removal of SSCWD groundwater TDS
Water Supply											
Surface Water - Lessalt	1,019	1,019				3,360	3360	3360	3360	3360	2004 Annual Drinking Water Quality Report, City of Hollister
Groundwater - COH	2,871	2,871				4,320	4,631	6,325	7,670	15,283	2004 Annual Drinking Water Quality Report, City of Hollister
Groundwater - SSCWD	285	285				285	285	285	285	285	2004 Annual Drinking Water Quality Report, City of Hollister
Demineralized Groundwater						0	0	0	0	0	
Water Supply - Calculated Ave TDS Concentration	557	961				632	642	681	704	773	
Target TDS Concentration - Water Supply											Weighted average TDS concentration
Wastewater Effluent TDS Concentration	1,214	1,214				1,157	1,167	1,206	1,229	1,298	Historic 2004 WWTP Data
Gain from Water Supply to Raw Wastewater	657	253			253	525	525	525	525	525	
Raw Wastewater TDS Concentration						1,157	1,167	1,206	1,229	1,298	
Target TDS Concentration - Treated Effluent					500 to 700	700	700	700	700	700	
Average Annual WWTP Flow (mgd)						2.72	3.48	4.00	4.59	7.68	
Demineralized Treated Effluent Quality						23.1	23.3	24.1	24.6	26.0	
Treated Effluent Flow (no demin)						1.6	2.1	2.3	2.6	4.1	
Calculated Effluent TDS Concentration						700	700	700	700	700	
Demineralization Capacity Requirements - Average (mgd)											
Water Supply						0.0	0.0	0.0	0.0	0.0	Estimated demineralization capacity requirements
Recycled Water						1.1	1.4	1.7	2.0	3.6	

Table B3b. Alternative 3 Raw Water Supply and Demineralization Capacity Requirements

Target Water Quality Goals (mg TDS/L)	Calculation Basis		MOU							
	Drinking Water	None	500							
Recycled Water	500	500 to 700								
		TDS Gain Calibration								
		2004 Data	Modified	MOU Goals	2005	2013	Year 2018	2023	Buildout	Source
Projected Water Demands										
Lower Level of Conservation					7,965	8,381	10,294	11,840	20,148	June 14, 2006 Water Demand Projections
Higher Level of Conservation					7,965	8,171	9,645	10,791	17,709	June 14, 2006 Water Demand Projections
	Average				7,965	8,276	9,970	11,315	18,928	Arithmetic average of lower and higher levels of conservation
Water Supply TDS Concentrations										
Surface Water - Lessalt		300	300		300	300	300	300	300	Average 2004 Annual Drinking Water Quality Report, City of Hollister
Groundwater - COH		627	1175		875	875	875	875	875	Average 2004 Annual Drinking Water Quality Report, City of Hollister
Groundwater - SSCWD		775	1175		875	875	875	875	875	Average 2004 Annual Drinking Water Quality Report, City of Hollister
Demineralized Groundwater		0	0		17.5	17.5	17.5	17.5	17.5	98 percent removal of SSCWD groundwater TDS
Water Supply										
Surface Water - Lessalt		1,019	1,019		3,360	3360	3360	3360	3360	2004 Annual Drinking Water Quality Report, City of Hollister
Groundwater - COH		2,871	2,871		4,320	4,631	6,325	7,670	15,283	2004 Annual Drinking Water Quality Report, City of Hollister
Groundwater - SSCWD		285	285		285	285	285	285	285	2004 Annual Drinking Water Quality Report, City of Hollister
Demineralized Groundwater					0	0	0	0	0	
Water Supply - Calculated Ave TDS Concentration		557	961		632	642	681	704	773	
Target TDS Concentration - Water Supply										Weighted average TDS concentration
Wastewater Effluent TDS Concentration		1,214	1,214		1,157	1,167	1,206	1,229	1,298	Historic 2004 WWTP Data
Gain from Water Supply to Raw Wastewater		657	253	253	525	525	525	525	525	
Raw Wastewater TDS Concentration					1,157	1,167	1,206	1,229	1,298	
Target TDS Concentration - Treated Effluent				500 to 700	500	500	500	500	500	
Average Annual WWTP Flow (mgd)					2.72	3.48	4.00	4.59	7.68	
Demineralized Treated Effluent Quality					23.1	23.3	24.1	24.6	26.0	
Treated Effluent Flow (no demin)					1.1	1.5	1.6	1.8	2.9	
Calculated Effluent TDS Concentration					500	500	500	500	500	
Demineralization Capacity Requirements - Average (mgd)										
Water Supply					0.0	0.0	0.0	0.0	0.0	Estimated demineralization capacity requirements
Recycled Water					1.6	2.0	2.4	2.8	4.8	